

Several specimens, more or less crushed, of a large *Lima* are among the forms collected. This species belongs to the general type of *Lima excavata* Fabr., *L. goliath* Sby, etc., and reaches to a length of four and a half inches. The valves are brilliantly polished, and in the middle part unsculptured, the anterior and posterior thirds are finely radially grooved with shallow grooves of which the outer slopes are less steep than the inner; the incremental lines, obsolete elsewhere, appear in the channel of the grooves and cross striate it here and there, giving the effect of obsolete punctation. I may add that close to the impressed area of the shell there are two or three coarser, deeper radial grooves. The species differs from the South Pacific and all other forms of its group known to me in its much finer and more delicate sculpture and brilliant polish. I await more perfect specimens before trying to figure it, but would propose the name of *Lima Hamlini* for the species in honor of Mr. Homer Hamlin C. E., Asst. City Engineer of Los Angeles, who is much interested in the geology and paleontology of the region, and has made valuable studies of the southern California Tertiary. The specimen in hand was kindly forwarded for examination by Dr. R. E. C. Stearns.

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#### A REVISION OF THE PHYSE OF NORTHEASTERN ILLINOIS.

BY FRANK C. BAKER.

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While working up the fresh-water mollusks of the Chicago area for a report on the Mollusca, the genus *Physa* came up for consideration, and the chaotic condition of the group, judging by the conflicting opinions of conchologists, seemed to warrant a somewhat critical revision of the species found in northeastern Illinois, and incidentally of northern Illinois. The best-known species, *heterostropha*, is little understood, and seems to be more frequently confounded with *gyrina* than with any other form, excepting, perhaps, *integra*.

A large collection of Physida, from different parts of the United States as well as from northern Illinois, has been examined, and the writer believes that all of the species found within the area have been elucidated. It is very probable that there are but ten or fifteen valid species of *Physa* in the United States, six or seven of which are to be found in the northern part of this region east of the Rocky Mountains.

During a visit to the Philadelphia Academy of Sciences some time ago, Mr. Pilsbry called the writer's attention to the fact that *heterostropha* had a smooth shell, while *gyrina* and some others had a shell with impressed spiral lines. Following up this suggestion a large number of Physæ have been examined, with the result that instead of there being two species in northern Illinois, there are at least four species and one variety.

The following notes have been made from fully adult specimens, and the figures are outline drawings of photographs, and are therefore accurate.

*Key to Northern Illinois Physæ.*

- A. Shell smooth, broad, spire short. *heterostropha.*  
 B. Shell with impressed spiral lines.  
 a. Shell rather broad, ovate, spire short, acute; aperture wide and spreading; whorl  $4\frac{1}{2}$ -5; shell thinner than b and c; peristome callus bordered by red. *sayii.*  
 b. Shell elongated or cylindrical, narrow, spire generally long; aperture very narrow; whorl 5-6; peristome callus bordered by red. *gyrina.*  
 c. Shell broad, inclining to be shouldered; spire sharply conic; aperture roundly oval; whorls  $4\frac{1}{2}$ -5; peristome callus white without red border. *integra.*

**Physa heterostropha** Say. Fig. 1.

*Limnæ heterostropha* SAY, Nich. Encycl., Amer. ed., pl. 1, fig. 6, 1817. *Physa fontana* HALDEMAN, Mon. pt. 2, p. 3 of cover; Physa, p. 26, 1841.

Shell polished, subovate; whorls  $4-4\frac{1}{2}$ ; spire moderately elevated, acute, the whorls slightly convex; color varying from light horn to greenish; sculpture consisting only of fine growth lines; sutures impressed, margined by a white line which is frequently bordered by a dark chestnut line; protoconch consisting of

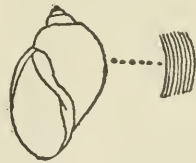


FIG. 1.

one whorl, which is smooth, and varies from porcelain-white to rather dark horn color; aperture rather large, oval, occupying from two-thirds to three-quarters of the length of the entire shell; peristome thin, acute, thickened on the inside by a whitish or bluish callus, which is bordered on the inside with red; columella almost straight, with a whitish callus which is sometimes lined with red.

Length 14.00; width 8.50; aperture length 10.00; width 4.00 mill. (Rochester, N. Y.)

Length 13.00; width 8.50; aperture length 10.00; width 4.50 mill. (Rochester, N. Y.)

Length 13.50; width 9.00; aperture length 10.50; width 4.50 mill. (La Porte, Ind.)

Length 9.00; width 6.00; aperture length 6.50; width 3.00 mill. (Chicago.)

Animal similar to that of *gyrina*. Jaw and radula in all respects like those of *gyrina*. Distribution: eastern and southern states from Maine to Georgia and west to Michigan and Illinois; Southern Canada. Geological distribution: Pleistocene; Loess. Habitat: in ponds and streams, adhering to sticks and stones, and crawling over the muddy bottom.

Only a single lot of shells has been found which could be referred to this species and that was collected in the drift along the shore of Lake Michigan at Miller's, Indiana. The nearest typical *heterostropha* have been found living in Pine Lake, La Porte Co., Indiana. It is very probable that this species is not found in any abundance west of Indiana, its place being taken by *gyrina*, *sayii* and *integra*. Under distribution above, only those states are given from which the writer has seen authentic specimens.

**Physa Sayii** Tappan. Fig. 2.

*Physa sayii* TAPPAN, Amer. Journ. Sci. (1), vol. xxxv, p. 369, pl. iii, fig. 3, 1839. *Physa warreniana* LEA, Proc. Phil. Acad. Sci., p. 115, 1864.

Shell polished, ovate, whorl  $5-5\frac{1}{2}$ ; spire elevated, very acute, the whorls moderately convex; color light horn to light chestnut; sculpture consisting of rather coarse growth lines, crossed by numerous fine, impressed spiral lines, giving the surface of the shell rather a wavy appearance, as figured for *gyrina*; sutures slightly impressed, bordered as in *heterostropha*; protoconch consisting of one and a half

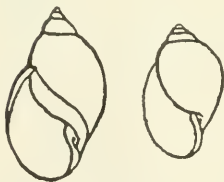


FIG. 2.

smooth, glossy whorls of a dark chestnut color; aperture very large, long oval, three-fourths to four-fifths the length of the whole shell; peristome thin, generally not much thickened within, whitish sometimes bordered with reddish; columella slightly twisted and cov-

ered with a spreading callus; the lower part of the aperture is somewhat produced.

Length 22.00; width 13.50; aperture length 16.00; width 7.50 mill. (Chicago.)

Length 19.00; width 12.00; aperture length 14.00; width 6.00 mill. (Chicago.)

Length 16.00; width 11.00; aperture length 12.00; width 6.00 mill. (Chicago.)

Animal similar in external appearance to all Physidæ. Jaw and radula as in *gyrina*. Distribution: Ohio, Indiana, Michigan, Illinois, Missouri. Geological distribution: Pleistocene; Loess. Habitat: In stations similar to *heterostropha* and *gyrina*.

Remarks: This species was at first identical as *ancillaria* Say, but that species, while having the same surface sculpture as *sayii*, is more inflated, the outer lip more spreading and the body whorl more gibbous, the spire being always much shorter and the whorls more convex. The surface sculpture is very beautiful and precisely as described for *gyrina*. This species is not common, and has been found at Joliet, Maywood, Lake Calumet and Lake Michigan near the foot of Oak Street. *Sayii* is apparently closely related to *ampullacea* Gould, a Pacific coast species.

**Physa gyrina** Say. Fig. 3.

*Physa gyrina* SAY, Journ. Acad. Nat. Sci. Phil., vol. 2, p. 171, 1821. *Physa striata* MENKE, Syn. Math., ed. 2, p. 32, 1830. *Physa hildrethiana* LEA, Proc. Amer. Phil. Soc., vol. 2, p. 32, 1841. *Physa cylindrica* NEWCOMB, in DeKay, N. Y. Moll., p. 77, pl. V, fig. 82, 1843. *Physa plicata* DEKAY, l. c., p. 78, pl. V, fig. 85, 1843. *Physa saffordii* LEA, Proc. Phil. Acad. Sci., p. 115, 1864. *Physa hawnii* LEA, l. c., p. 115, 1864. *Physa parva* LEA, l. c., p. 115, 1864.

Shell elongated, generally polished, whorls 5-6; spire always very long (as compared with the last two species), acute, the whorls in some cases almost flat, and at best but slightly convex, color varying between light-greenish horn and brick-red; sculpture consisting of well-marked growth lines, crossed by numerous fine impressed spiral lines, giving the shell a wrinkled appearance (see figure of sculpture); these lines appear at first to be raised, but when viewed through the microscope are seen to be impressed between two wrinkled ridges, as seen in the cut; sutures scarcely impressed, but

bordered by a porcelain-white line which is rarely edged with chestnut; aperture rather long, long-oval in form, much narrowed at the upper part, more than a half and less than two-thirds the length of

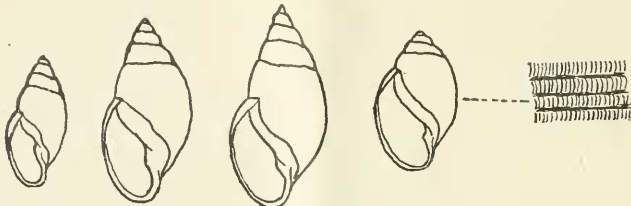


FIG. 3.

the entire shell; peristome thin, thickened within by a callus which is either bordered by a dark chestnut band or else is itself of that color; columella thickened with a decided white callus or plait; the lower part of the aperture is produced; the periods of winter hibernation are frequently marked by a whitish band in the body of the shell; protoconch consisting of a trifle more than one smooth, rounded, dark chestnut-colored whorl.

Length 17.00; width 9.00; aperture length 11.00; width 4.50 mill. (Chicago.)

Length 26.00; width 12.00; aperture length 14.00; width 5.50 mill. (Chicago.)

Length 24.00; width 11.50; aperture length 13.00; width 5.50 mill. (Chicago.)

Length 19.00; width 10.00; aperture length 12.00; width 5.00 mill. (Chicago.)

Length 22.00; width 10.00; aperture length 12.50; width 5.00 mill. (Chicago.)

Animal with a long and rather narrow foot, acutely pointed behind and rounded before, where it is produced into lateral lobes; the foot does not extend much beyond the edge of the shell; color blackish or yellowish gray, dotted or flecked with whitish or yellowish, the dots being distinctly seen through the transparent shell; the front of the head is ornamented by two yellowish spots of good size, composed of numerous minute dots; the mantle is brown, spotted with yellowish, is reflected over a portion of the shell on the right side, and produced into four filiform digitations; tentacles very long and slender, tapering to a point; head distinct, separated from

the foot by a short neck; mouth large, in the lower plane of the head, showing plainly the jaw and radula while the animal is grazing along the side of an aquarium; eyes placed on swellings at the inner base of the tentacles; respiratory cavity on left side of the shell at the lower point where the peristome meets the body whorl. Length of foot 15.00; width 4 mill. extended (Fig. 4).

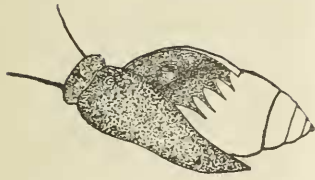


FIG. 4.

Jaw in one piece, arched, striated, provided with a central fibrous projection from the superior surface; ends rounded (Fig. 5, J).

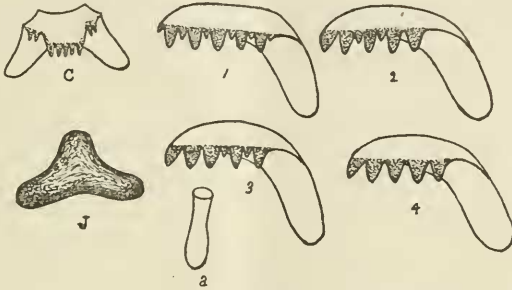


FIG. 5.

Radula: Formula  $\frac{95}{13} + \frac{95}{1} + \frac{1}{2.5.2} + \frac{95}{1} + \frac{95}{13}$  (190-1-190); central

tooth more or less quadrate, the lower outer corners being very much attenuated; cusp 9-dentate, 5 denticles being long and narrow, and two on each side smaller and more blunt; laterals in two alternate series, the primary teeth large, obliquely inclined, comb-like; the cusps are very peculiar, and vary to a large degree; some teeth have five long, pointed cusps with six small ones, one between each large one and one at each end (Fig. 5); others have but two small denticles, while still others have one or more between (Figs. 5, 2, 3, 4). The secondary teeth are long and narrow, with a wide, blunt cusp. These latter, as also the central tooth and small teeth between the cusps of the primary teeth, are very difficult to observe (Fig. 5).

Distribution: Probably inhabits the whole of the northern and central parts of the United States and Southern Canada. Geological distribution: Pleistocene; Loess. Habitat: Found very abund-

antly in ponds and streams of greater or lesser size, adhering to sticks or stones, and crawling over the muddy bottom. Inhabits either running water or stagnant pools.

Remarks: This is a very common and handsome species. Its habits are active, moving with a rapid, steady, gliding motion. It is very interesting to watch a number of *Physæ* in an aquarium; as they are crawling along the bottom, one will be seen to rise suddenly to the top of the water and move along with the foot applied to the surface, the shell hanging down. Again, they may be seen descending, suspended by a thin thread of mucus. When the animal rises suddenly, the branchial cavity opens with a faint clicking sound, probably due to the pressure of air in the lung. This species frequently inhabits water as cold as the freezing point, and may be observed in winter gliding along the bottom of a pond when the surface is frozen. The eggs are deposited on stones, the under side of sticks, etc., and are composed of large, glairy, transparent masses.

Several *Physæ* kept in captivity laid four egg masses on April 23, 1897. The egg masses measured 20 by 4 mill., and contained from 120 to 200 eggs. On April 24, ten additional egg masses were laid. The jar contained 15 individuals. On June 3, in the afternoon, the writer noticed a number of young in a jar containing egg masses deposited probably in the latter part of April. The young were half a mill. in length, vitreous in appearance and perfectly transparent. They were very lively, crawling about the jar and feeding voraciously upon the scum found on the sides of the glass. The heart pulsed 120 times per minute. On June 15th the young had increased to one mill. in length. About a week later, unfortunately, the whole lot died, so that no further notes could be taken.

*Physa gyrina* is by far the most common species of the genus (I might say of any genus) found in the area, and has been found in all parts of northern Illinois. It was at first confused with *heterostropha*, but that species has a smooth shell (see above) and is not found in any numbers in the area; it is very probable that *heterostropha* is not found west of the Mississippi River, and the quotations of this species from western localities were probably founded on *gyrina*, *sayii*, *gabbi*, *integra*, etc. This species is very variable in this region, some forms approaching *ampullacea* Gould, while others might be taken for *gabbi* Tryon, or *virginea* Gould, so far as form goes. It is probable that some west coast names will be added to the above synonymy, when more study is given to this genus.

**Physa gyrina elliptica** Lea. Fig. 6.

*Physa elliptica* LEA, Trans. Amer. Phil. Soc., vol. V, p. 115, pl. xix, fig. 83, 1837. *Physa aurea* LEA, l.c., vol. VI, p. 18, pl. xxiii, fig. 106, 1839. *Physa troostiana* LEA, Proc. Am. Phil. Soc., vol. II, p. 32, 1841. *Physa nicklinii* LEA, Proc. Phil. Acad. Sci., p. 114, 1864. *Physa altonensis* LEA, l.c., p. 114, 1864. *Physa febigerii* LEA, l.c., p. 114, 1864. *Physa oleacea* TRYON, Amer. Journ. Conch., vol. II, p. 6, pl. ii, fig. 6, 1866.

Shell differing from typical *gyrina* in being more elliptical, having a shorter, more rounded spire, and hence more convex whorls, the spire, as described by Tryon, "with the outline not elevated above a continuation of the general curve of the body." The shell is also more solid and the outer lip thicker with a very heavy, bluish-white callus. The surface sculpture is the same as in *gyrina*.



FIG. 6.

Length 15.00; width 7.50; aperture length 9.50; width 3.50 mill.

Length 11.00; width 6.00; aperture length 7.00; width 2.50 mill.

Length 12.00; width 7.50; aperture length 9.00; width 3.75 mill.

Animal, jaw, and radula, as in *gyrina*. Distribution: evidently the same as *gyrina*. Geological distribution: Pleistocene; Loess. Habitat: Almost always associated with *gyrina*.

Remarks: The typical form of this variety seems at first quite distinct from *gyrina*, but in a multitude of forms (the writer has examined several thousand specimens) is seen to fade imperceptibly into the typical form. From observations in the present area, *gyrina* would seem to be dimorphic, consisting of the typical *gyrina* with long spire, and the variety *elliptica* with short, dome-shaped spire. This belief is strengthened by the fact that the two forms are always associated together. It is not quite as common as the typical form.

**Physa integra** Haldeman. Fig. 7.

*Physa integra* HALDEMAN, Mon. p. 33, pl. IV, fig. 7, 8, 1841.

*Physa niagarensis* LEA, Proc. Phil. Acad. Sci., p. 114, 1864.

Shell oval, whorls  $4\frac{1}{2}$ -5; spire short, pointed, the whole convex; sutures well marked, sometimes banded by a faint white line; color varying from light yellowish horn to pale brown; sculpture as in *gyrina*, the lines being very deep and the wrinkled edges very convex; protoconch consisting of one and a half smooth, rounded, wine-colored whorls; aperture oval, rather wide, produced at the



anterior end, about two-thirds the length of the entire shell; peristome thin, thickened within the aperture by a heavy white or yellowish callus, which shows through the shell very plainly; it is never bordered by any color stripe; the callus of two or three former peristomes may always be seen on the body whorl and sometimes one or two on the spire; columella

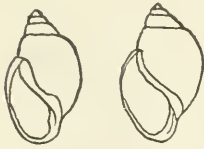


FIG. 7.

broad, flat, white, a callus spreading over the parietal wall.

Length 12.00; width 8.00; aperture length 7.50; width 3.00 mill.

Length 10.50; width 7.50; aperture length 7.50; width 3.50 mill.

Length 10.00; width 6.00; aperture length 5.50; width 3.00 mill.

Animal not differing essentially from *gyrina*. Jaw similar to that of *gyrina*. Radula similar in form to that of *gyrina*, but differing in having six large, nearly equal cusps, instead of five, in the absence, generally, of small cusps between the larger ones, and in the reflection being wider than in *gyrina* or *heterostropha*. The radula of this species is remarkably uniform in the form of the teeth and in the number of the cusps. The central tooth and secondary teeth appeared to be the same as in the species previously described.

Distribution: Great Lakes and St. Lawrence River, New York, Indiana, Illinois, Tennessee, Michigan, Wisconsin. Found in great abundance in Allen's Creek, near Rochester, New York. Geological distribution: Pleistocene; Loess. Habitat: At stations similar to *gyrina*.

Remarks: This species has been generally confounded with *heterostropha*, but will at once be separated from that species by the spiral lines; the general form also is different from any other shell found in this area, and the white callus on the lip is peculiar. It is a common shell at Hickory Creek, Lockport and Joliet, and has been found, though more sparingly, at Calumet Grove, Maywood and at Edgewater. It is more common than *sayi*, but less so than *gyrina*. The specimens from Hickory Creek are quite typical, resembling closely Haldeman's figures (pl. 4, figs. 7, 8) in his monograph of fresh water mollusca.